

APPENDIX D. TISSUE COMPOSITING PLAN AND TISSUE PREPARATION NOTES

Clam Tissue Compositing Plan

MEMORANDUM

To: Elly Hale, EPA
From: Windward on behalf of LDWG
Subject: LDW pre-design studies: clam tissue compositing plan
Date: June 8, 2018

Clams were collected throughout the Lower Duwamish Waterway (LDW) from May 15 to 19, 2018, as described in the US Environmental Protection Agency (EPA)-approved quality assurance project plan (QAPP) (Windward 2018). This memorandum presents the compositing plan for the collected clams for approval by EPA. The field data for each of the individual clams are provided in Attachment A.

SUMMARY OF CLAM TISSUE COLLECTION

As described in the QAPP, clam tissues were collected to fulfill three different data quality objectives (DQOs):

- u Clam tissue DQO 1 – Establish baseline site-wide 95% upper confidence limit (on the mean) (95UCL) concentrations of human health risk drivers for comparison to target tissue levels (TTLs) for remedial action objective (RAO) 1.
- u Clam tissue DQO 2 – Calculate baseline site-wide mean clam tissue concentrations to assess trends following sediment remediation for contaminants with TTLs. For the LDW non-risk driver chemicals, calculate the site-wide average concentrations in three segment-wide intertidal composite samples to assess trends for these chemicals.
- u Porewater DQO 1 – Assess the relationship among concentrations of carcinogenic polycyclic aromatic hydrocarbons (cPAHs) in clam tissue, porewater, and sediment to help evaluate whether achieving sediment cleanup levels for cPAHs will reduce concentrations in clam tissue to TTLs.

For clam tissue DQOs 1 and 2, 13 clams were needed from each of the 11 clam tissue collection areas (3 clams for the arsenic composite and 10 clams for the other risk driver

composite¹). For porewater DQO 1, 3 clams (along with co-located sediment) were needed from each of the 20 cPAH porewater investigation areas. The target numbers of clams were collected from the majority of areas (Table 1). The sediment and tissue samples will be analyzed for cPAHs within three weeks of sample collection. The cPAH sediment and tissue data will be used to select a minimum of 10 locations, where freely dissolved concentrations of individual cPAHs in porewater will be determined using passive samplers exposed to the sediment *ex situ*.

Table 1. Target and actual numbers of clams by collection area

Clam Tissue Collection	cPAH Porewater Investigati on Areas	Target No. of Clams	Actual No. of Clams Collected ^a	Sufficient Clams Collected?			Notes
				Clam Tissue DQOs 1 and 2		Porewater DQO 1	
				Inorganic Arsenic Composite	Other Risk Driver Composite		
1	1, 2	19	19	ü	ü	ü	none
2	4, 6	19	19	ü	ü	ü	none
3	3, 5	19	19	ü	ü	ü	none
4	7, 8	19	19	ü	ü	ü	location of cPAH area 8 moved in the field to a comparable area where clams were present (see Maps 1–3)
5	9, 10	19	19	ü	ü	ü	none
6	11	16	16	ü	ü	ü	none
7	none	13	4	ü	no (insufficient clams)	na	fewer than the target number of clams collected; maximum level of effort of 9 person-hours reached
8	12	16	16	ü	ü	ü	none
9	13, 14, 15, 16	25	7	ü	no (insufficient clams)	investigation area 13 only	fewer than the target number of clams collected; maximum level of effort of 12 person-hours reached
10	19, 20	19	16	ü	ü	investigation area 19 only	clams/sediment not collected from cPAH area 20 due to insufficient clams in both this area and a potential alternate area
11	17, 18	19	19	ü	ü	ü	none

^a An extra five clams were collected from each of the clam tissue collection areas 1, 2, 3, 4, 5, 6, 8, 10, and 11 to provide additional compositing options. Extra clams were not available from areas 7 and 9.

cPAH – carcinogenic polycyclic aromatic hydrocarbon na – not applicable

DQO – data quality objective

Sufficient clams could not be collected from the following areas:

- u **cPAH porewater investigation area 8** – No clams could be collected from cPAH porewater investigation area 8 (no habitat in this area). The field crew was able to identify a different area with anticipated similar cPAH toxic equivalents (TEQs),

¹ The other risk driver composite samples will be analyzed for polychlorinated biphenyls (PCBs), dioxins/furans, and cPAHs. Inorganic arsenic will be analyzed in separate composite samples, because siphon skin will be analyzed separately from the remainder of the clam (Windward 2018).

so cPAH porewater investigation area 8 was relocated to the northern end of clam tissue collection area 4.

- u **Clam tissue collection area 7** – As anticipated, the target numbers of clams were not collected from this area (Slip 4), which was remediated in 2012. A total of four clams were collected from this area. Per discussion with EPA, three of these clams (excluding the one undersized clam) will be used for the inorganic arsenic composite; insufficient mass is available to analyze for other risk drivers.
- u **Clam tissue collection area 9 and cPAH porewater investigation areas 14 to 16** – A total of seven clams were collected from clam tissue collection area 9, including five clams from the vicinity of cPAH porewater investigation area 13, one clam from cPAH porewater investigation area 14, and one clam at approximately river mile (RM) 3.2. Clams were not abundant in this clam tissue collection area, and suitable habitat was patchy.

As discussed with EPA, the three clams for which co-located sediment was collected in cPAH porewater investigation area 13 will be used for the cPAH porewater evaluation, and three of the remaining four clams from clam tissue collection area 9 will be included in the inorganic arsenic composite. With the exception of the single clam from cPAH porewater investigation area 14, clam or sediment samples were not collected from the other three cPAH porewater investigation areas (14, 15, and 16), because sufficient clams were not present in these areas.

- u **cPAH porewater investigation area 20** – Insufficient clams were available in cPAH porewater investigation area 20, so no tissue or sediment samples were collected for this area.

CLAM TISSUE COMPOSITES

As detailed in Attachment A, clams were distributed among composite samples to fulfill the three DQOs outlined in the QAPP (Windward 2018). Composites for clam tissue DQOs 1 and 2 were derived using the following criteria:

- u **Spatial coverage** – Clams included in composites were, to the extent possible, selected to provide good spatial coverage of the clam collection area.
- u **Clam size** – Only clams > 2 cm in width were included in composites; a range of clam sizes was included in the composites to the extent possible. Note that clam size varied among the tissue collection areas.

Based on these criteria, Table 2 presents information regarding the inorganic arsenic composites and other risk driver composites for clam tissue DQOs 1 and 2. For the third DQO (i.e., porewater DQO 1), clams included in the composites for the cPAH porewater investigation were determined in the field, because of the need to collect co-located sediment. Thus, the clams selected were collected within a cPAH porewater investigation area and were located as close to one another as possible. Table 3 presents clam composite information for porewater DQO 1.

Table 2. Clams included in inorganic arsenic and other risk driver composites for clam tissue DQOs 1 and 2

Clam Tissue Collection Area	Inorganic Arsenic Composite			Other Risk Driver Composite			Segment-wide Composite ^b		
	Composite ID ^a	Clam Width (mm)		Composite ID	Clam Width (mm)		Composite ID	Clam Width (mm)	
		Average	Range		Average	Range		Average	Range
Intertidal segment 1:									
1	LDW18-C01-CLSP-Comp1; LDW18-C01-CLRM-Comp1	32	24 - 42	LDW18-C01- CLWB-Comp2	33	24 - 42	LDW18-S1-CLWB- Comp1	29	22 - 42
2	LDW18-C02-CLSP-Comp1; LDW18-C02-CLRM-Comp1	32	26 - 37	LDW18-C02- CLWB-Comp2	30	23 - 38			
3	LDW18-C03-CLSP-Comp1; LDW18-C03-CLRM-Comp1	26	23 - 28	LDW18-C03- CLWB-Comp2	25	22 - 32			
Intertidal segment 2:									
4	LDW18-C04-CLSP-Comp1; LDW18-C04-CLRM-Comp1	24	21 - 28	LDW18-C04- CLWB-Comp2	24	21 - 29	LDW18-S2-CLWB- Comp1	26	21 - 40
5	LDW18-C05-CLSP-Comp1; LDW18-C05-CLRM-Comp1	27	24 - 32	LDW18-C05- CLWB-Comp2	28	23 - 40			
6	LDW18-C06-CLSP-Comp1; LDW18-C06-CLRM-Comp1	27	22 - 34	LDW18-C06- CLWB-Comp2	27	22 - 39			
Intertidal segment 3:									
7	LDW18-C07-CLSP-Comp1; LDW18-C07-CLRM-Comp1	23	20 - 25	na	insufficient clams collected		LDW18-S2-CLWB- Comp1	29	22 - 37
8	LDW18-C08-CLSP-Comp1; LDW18-C08-CLRM-Comp1	28	22 - 33	LDW18-C08- CLWB-Comp2	28	22 - 34			
9	LDW18-C09-CLSP-Comp1; LDW18-C09-CLRM-Comp1	26	22 - 33	na	insufficient clams collected				
10	LDW18-C10-CLSP-Comp1; LDW18-C10-CLRM-Comp1	29	23 - 35	LDW18-C10- CLWB-Comp2	30	23 - 37			
11	LDW18-C11-CLSP-Comp1; LDW18-C11-CLRM-Comp1	30	24 - 35	LDW18-C11- CLWB-Comp2	29	22 - 36			

Note: As described in the QAPP, 3 clams were included in each inorganic arsenic composite, and 10 clams were included in each composite for the other risk drivers (i.e., PCBs, dioxins/furans, and cPAHs).

^a Each tissue collection area had a composite sample of siphon skin (SP) and remainder (RM) clam tissue.

^b Segment-wide composites included equal amounts of homogenized tissue from each of the clam tissue collection area composite samples from that segment. These samples will be analyzed for non-risk driver chemicals per the QAPP.

cPAH – carcinogenic polycyclic aromatic hydrocarbon

ID – identification

PCB – polychlorinated biphenyl

DQO – data quality objective

na – not applicable

QAPP – quality assurance project plan

Table 3. Clams included in cPAH composites for porewater DQO 1

cPAH Porewater Investigation Area	Composite ID	Clams per Composite	Clam Width (mm)	
			Average	Range
1	LDW18-A01-CLWB-Comp1	3	24	22–26
2	LDW18-A02-CLWB-Comp1	3	24	20–29
3	LDW18-A03-CLWB-Comp1	3	27	25–28
4	LDW18-A04-CLWB-Comp1	3	34	32–36
5	LDW18-A05-CLWB-Comp1	3	26	22–32
6	LDW18-A06-CLWB-Comp1	3	33	32–33
7	LDW18-A07-CLWB-Comp1	3	25	22–28
8	LDW18-A08-CLWB-Comp1	3	25	23–26
9	LDW18-A09-CLWB-Comp1	3	27	22–35
10	LDW18-A10-CLWB-Comp1	3	29	23–39
11	LDW18-A11-CLWB-Comp1	3	26	26–27
12	LDW18-A12-CLWB-Comp1	3	27	24–31
13	LDW18-A13-CLWB-Comp1	3	29	26–34
14	na	na	insufficient clams collected	
15	na	na	insufficient clams collected	
16	na	na	insufficient clams collected	
17	LDW18-A17-CLWB-Comp1	3	32	29–35
18	LDW18-A18-CLWB-Comp1	3	30	27–36
19	LDW18-A19-CLWB-Comp1	3	35	30–43
20	na	na	insufficient clams collected	

Note: As discussed in the QAPP, clams included in the cPAH porewater investigation composites were determined in the field, because of the need to collect co-located sediment.

cPAH – carcinogenic polycyclic aromatic hydrocarbon

na – not applicable

DQO – data quality objective

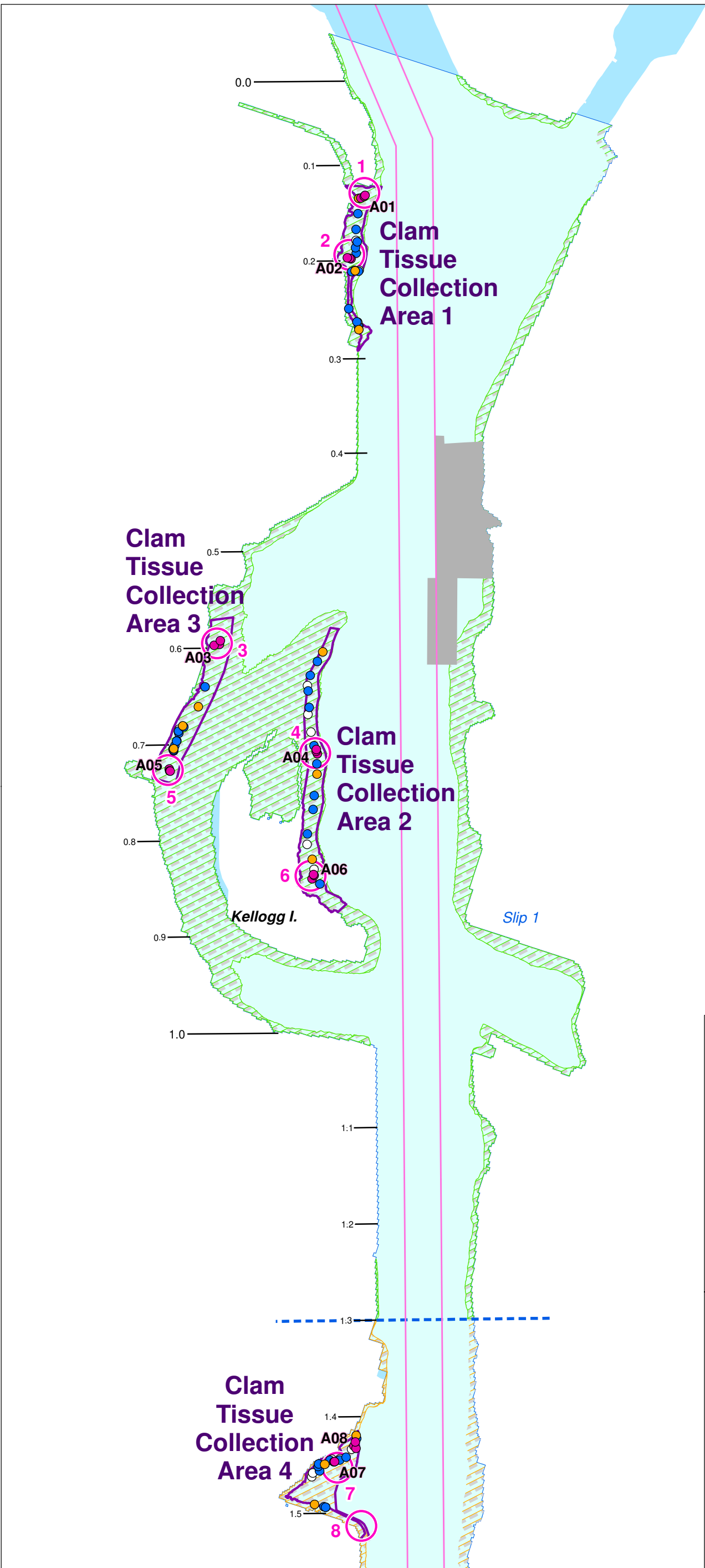
QAPP – quality assurance project plan

ID – identification

REFERENCES

Windward. 2018. Lower Duwamish Waterway clam collection and chemical analyses - quality assurance project plan. Final. Windward Environmental LLC, Seattle, WA.

Prepared by craigh, 6/8/2018, W:\Projects\Duwamish AOC\GIS\Maps and Analysis\Task 04 Sampling and Analysis\Clam Tissue-Seep Recon Fieldwork\Clam Compositing Memo\6862a Clam composites.mxd



- Clams included in cPAH porewater investigation composites
- Clams included in inorganic arsenic composites
- Clams included in other risk driver composites
- Clams not proposed for inclusion in composites
- cPAH porewater investigation area^a
- Clam tissue sampling area

Clam tissue intertidal segments

- ▨ Segment 1
- ▨ Segment 2
- ▨ Segment 3
- - Intertidal segment boundary
- Early Action Area
- LDW Superfund Boundary
- Navigation Channel
- River mile

^a Circle sizes in map are exaggerated to 4x actual size for visibility.

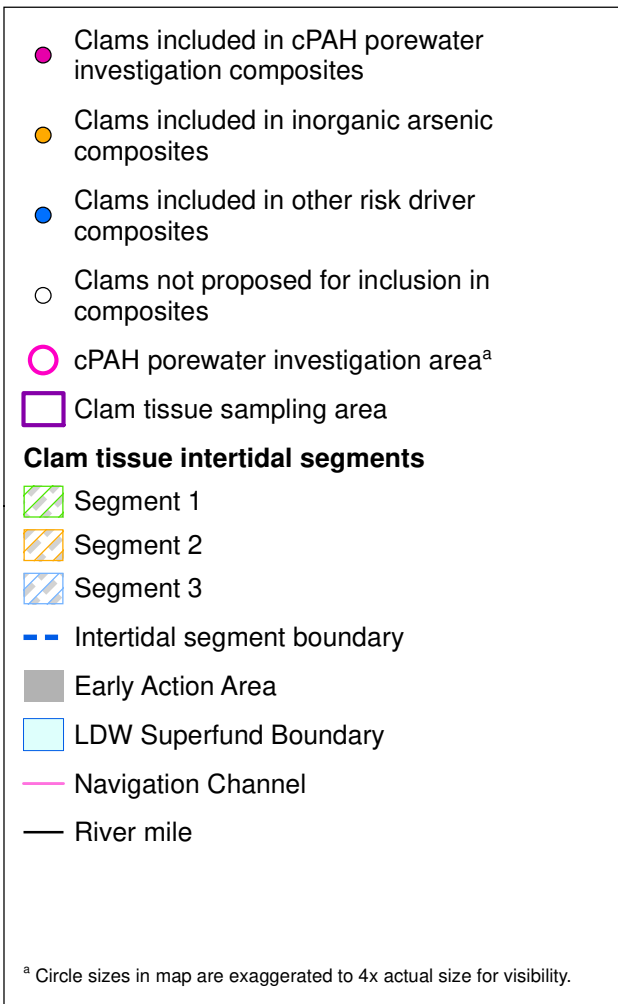


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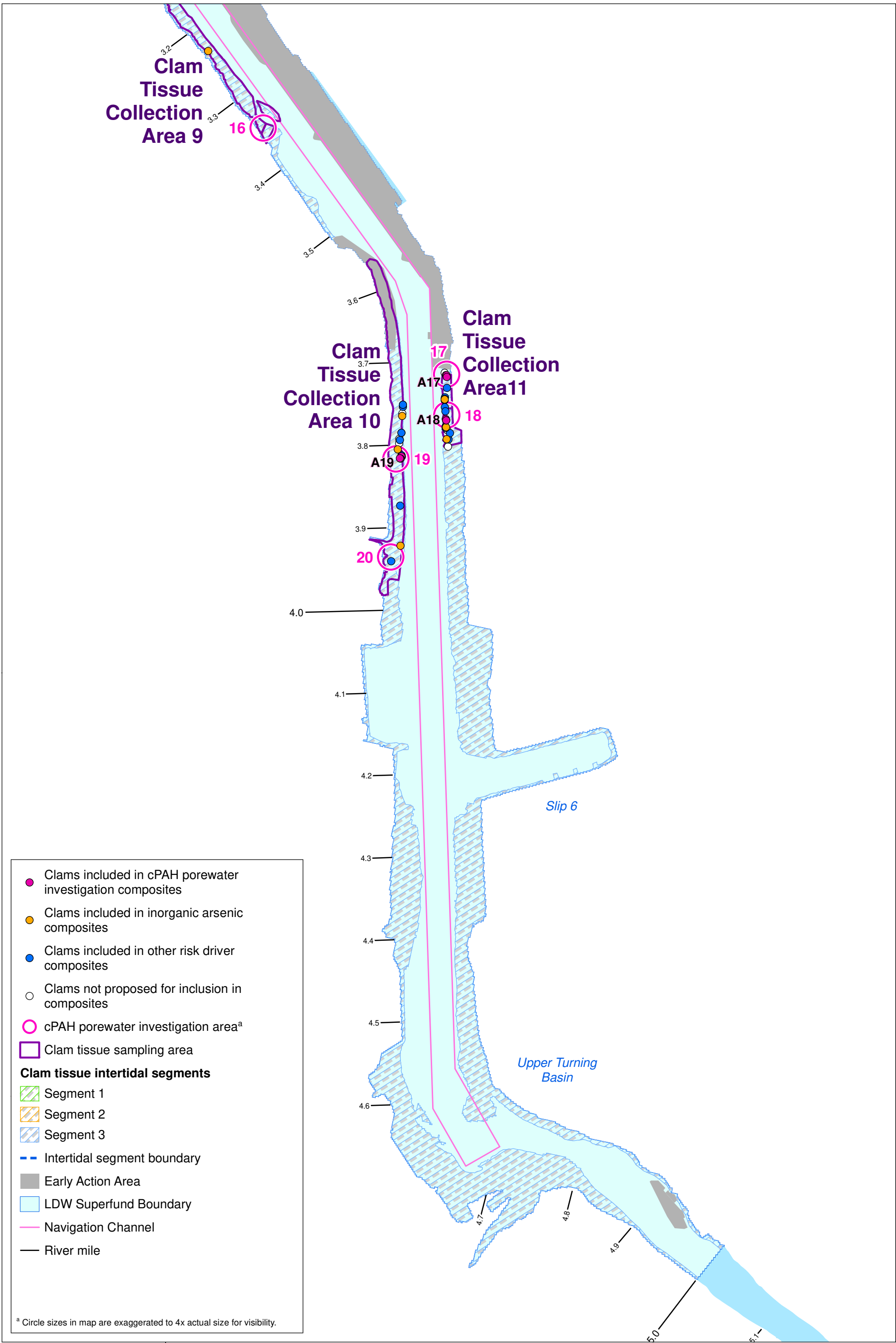


Map 1. Assignment of clams to composite samples, RM 0.0 to 1.5

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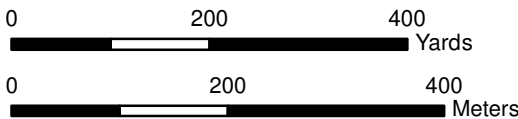


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Map 3. Assignment of clams to composite samples, RM 3.1 to 5.0

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Attachment A. Clam tissue collection data

Collection date	Clam Tissue Collection Area ID	Clam ID	Collection Time	Width (mm)	Included in Other Risk Driver Composite?	Included in Inorganic Arsenic Composite?	Included in cPAH Porewater Investigation Area Composite?	Composite ID(s), if applicable	Extra Clam (Not Included in Composite)
5/16/2018	1	LDW18-C01-CL03	13:17	24	yes			LDW18-C01-CLWB-Comp2	
5/16/2018	1	LDW18-C01-CL14	13:48	24		yes		LDW18-C01-CLSP-Comp1 and LDW18-C01-CLRM-Comp1	
5/16/2018	1	LDW18-C01-CL07	13:10	26	yes			LDW18-C01-CLWB-Comp2	
5/16/2018	1	LDW18-C01-CL06	13:27	27	yes			LDW18-C01-CLWB-Comp2	
5/16/2018	1	LDW18-C01-CL10	13:13	27					x
5/16/2018	1	LDW18-C01-CL15	13:23	29	yes			LDW18-C01-CLWB-Comp2	
5/16/2018	1	LDW18-C01-CL11	13:50	30		yes		LDW18-C01-CLSP-Comp1 and LDW18-C01-CLRM-Comp1	
5/16/2018	1	LDW18-C01-CL02	13:41	31					x
5/16/2018	1	LDW18-C01-CL24	13:23	32	yes			LDW18-C01-CLWB-Comp2	
5/16/2018	1	LDW18-C01-CL17	13:21	33	yes			LDW18-C01-CLWB-Comp2	
5/16/2018	1	LDW18-C01-CL18	13:20	34					x
5/16/2018	1	LDW18-C01-CL19	13:27	35	yes			LDW18-C01-CLWB-Comp2	
5/16/2018	1	LDW18-C01-CL20	13:12	38	yes			LDW18-C01-CLWB-Comp2	
5/16/2018	1	LDW18-C01-CL01	13:12	40					x
5/16/2018	1	LDW18-C01-CL16	13:25	41	yes			LDW18-C01-CLWB-Comp2	
5/16/2018	1	LDW18-C01-CL04	13:32	42		yes		LDW18-C01-CLSP-Comp1 and LDW18-C01-CLRM-Comp1	
5/16/2018	1	LDW18-C01-CL21	13:33	42	yes			LDW18-C01-CLWB-Comp2	
5/16/2018	1	LDW18-C01-CL23	13:21	49					x
5/16/2018	2	LDW18-C02-CL14	11:03	23	yes			LDW18-C02-CLWB-Comp2	
5/16/2018	2	LDW18-C02-CL06	11:56	25	yes			LDW18-C02-CLWB-Comp2	
5/16/2018	2	LDW18-C02-CL18	11:10	25					x
5/16/2018	2	LDW18-C02-CL11	11:09	26					x
5/16/2018	2	LDW18-C02-CL16	11:24	26	yes			LDW18-C02-CLWB-Comp2	
5/16/2018	2	LDW18-C02-CL22	11:53	26		yes		LDW18-C02-CLSP-Comp1 and LDW18-C02-CLRM-Comp1	
5/16/2018	2	LDW18-C02-CL01	11:01	28	yes			LDW18-C02-CLWB-Comp2	
5/16/2018	2	LDW18-C02-CL04	11:02	30					x
5/16/2018	2	LDW18-C02-CL10	10:57	30	yes			LDW18-C02-CLWB-Comp2	
5/16/2018	2	LDW18-C02-CL02	11:47	32					x
5/16/2018	2	LDW18-C02-CL07	11:42	32		yes		LDW18-C02-CLSP-Comp1 and LDW18-C02-CLRM-Comp1	
5/16/2018	2	LDW18-C02-CL17	11:46	32	yes			LDW18-C02-CLWB-Comp2	
5/16/2018	2	LDW18-C02-CL20	11:31	32	yes			LDW18-C02-CLWB-Comp2	
5/16/2018	2	LDW18-C02-CL05	10:59	34	yes			LDW18-C02-CLWB-Comp2	
5/16/2018	2	LDW18-C02-CL09	11:34	35					x
5/16/2018	2	LDW18-C02-CL15	11:57	36	yes			LDW18-C02-CLWB-Comp2	
5/16/2018	2	LDW18-C02-CL12	12:02	37		yes		LDW18-C02-CLSP-Comp1 and LDW18-C02-CLRM-Comp1	
5/16/2018	2	LDW18-C02-CL08	11:30	38	yes			LDW18-C02-CLWB-Comp2	

Collection date	Clam Tissue Collection Area ID	Clam ID	Collection Time	Width (mm)	Included in Other Risk Driver Composite?	Included in Inorganic Arsenic Composite?	Included in cPAH Porewater Investigation Area Composite?	Composite ID(s), if applicable	Extra Clam (Not Included in Composite)
5/16/2018	3	LDW18-C03-CL09	11:46	20					x
5/16/2018	3	LDW18-C03-CL13	12:00	20					x
5/16/2018	3	LDW18-C03-CL04	12:20	22	yes			LDW18-C03-CLWB-Comp2	
5/16/2018	3	LDW18-C03-CL16	12:28	22					x
5/16/2018	3	LDW18-C03-CL05	12:28	23		yes		LDW18-C03-CLSP-Comp1 and LDW18-C03-CLRM-Comp1	
5/16/2018	3	LDW18-C03-CL06	11:41	23	yes			LDW18-C03-CLWB-Comp2	
5/16/2018	3	LDW18-C03-CL12	11:55	23	yes			LDW18-C03-CLWB-Comp2	
5/16/2018	3	LDW18-C03-CL07	11:43	24					x
5/16/2018	3	LDW18-C03-CL14	12:20	24	yes			LDW18-C03-CLWB-Comp2	
5/16/2018	3	LDW18-C03-CL24	12:40	24	yes			LDW18-C03-CLWB-Comp2	
5/16/2018	3	LDW18-C03-CL17	12:32	25	yes			LDW18-C03-CLWB-Comp2	
5/16/2018	3	LDW18-C03-CL19	12:54	25					x
5/16/2018	3	LDW18-C03-CL18	12:40	26		yes		LDW18-C03-CLSP-Comp1 and LDW18-C03-CLRM-Comp1	
5/16/2018	3	LDW18-C03-CL08	11:45	27	yes			LDW18-C03-CLWB-Comp2	
5/16/2018	3	LDW18-C03-CL11	11:49	27	yes			LDW18-C03-CLWB-Comp2	
5/16/2018	3	LDW18-C03-CL20	11:58	27	yes			LDW18-C03-CLWB-Comp2	
5/16/2018	3	LDW18-C03-CL10	11:50	28		yes		LDW18-C03-CLSP-Comp1 and LDW18-C03-CLRM-Comp1	
5/16/2018	3	LDW18-C03-CL15	12:25	32	yes			LDW18-C03-CLWB-Comp2	
5/19/2018	4	LDW18-C04-CL03	14:00	20					x
5/19/2018	4	LDW18-C04-CL23	13:05	20					x
5/19/2018	4	LDW18-C04-CL06	14:35	21					x
5/19/2018	4	LDW18-C04-CL08	14:43	21					x
5/19/2018	4	LDW18-C04-CL10	14:00	21	yes			LDW18-C04-CLWB-Comp2	
5/19/2018	4	LDW18-C04-CL20	13:21	21	yes			LDW18-C04-CLWB-Comp2	
5/19/2018	4	LDW18-C04-CL24	12:59	21		yes		LDW18-C04-CLSP-Comp1 and LDW18-C04-CLRM-Comp1	
5/19/2018	4	LDW18-C04-CL01	13:45	23	yes			LDW18-C04-CLWB-Comp2	
5/19/2018	4	LDW18-C04-CL04	14:16	23	yes			LDW18-C04-CLWB-Comp2	
5/19/2018	4	LDW18-C04-CL07	14:24	24	yes			LDW18-C04-CLWB-Comp2	
5/19/2018	4	LDW18-C04-CL16	12:50	24	yes			LDW18-C04-CLWB-Comp2	
5/19/2018	4	LDW18-C04-CL17	13:16	24		yes		LDW18-C04-CLSP-Comp1 and LDW18-C04-CLRM-Comp1	
5/19/2018	4	LDW18-C04-CL15	13:00	25					x
5/19/2018	4	LDW18-C04-CL18	13:47	25	yes			LDW18-C04-CLWB-Comp2	
5/19/2018	4	LDW18-C04-CL02	14:45	26	yes			LDW18-C04-CLWB-Comp2	
5/19/2018	4	LDW18-C04-CL11	13:20	27	yes			LDW18-C04-CLWB-Comp2	
5/19/2018	4	LDW18-C04-CL09	14:15	28		yes		LDW18-C04-CLSP-Comp1 and LDW18-C04-CLRM-Comp1	
5/19/2018	4	LDW18-C04-CL21	13:54	29	yes			LDW18-C04-CLWB-Comp2	
5/18/2018	5	LDW18-C05-CL15	15:05	23					x
5/18/2018	5	LDW18-C05-CL24	15:30	23	yes			LDW18-C05-CLWB-Comp2	

Collection date	Clam Tissue Collection Area ID	Clam ID	Collection Time	Width (mm)	Included in Other Risk Driver Composite?	Included in Inorganic Arsenic Composite?	Included in cPAH Porewater Investigation Area Composite?	Composite ID(s), if applicable	Extra Clam (Not Included in Composite)
5/18/2018	5	LDW18-C05-CL06	14:59	24	yes			LDW18-C05-CLWB-Comp2	
5/18/2018	5	LDW18-C05-CL19	14:50	24		yes		LDW18-C05-CLSP-Comp1 and LDW18-C05-CLRM-Comp1	
5/18/2018	5	LDW18-C05-CL03	15:05	25					x
5/18/2018	5	LDW18-C05-CL05	15:30	25	yes			LDW18-C05-CLWB-Comp2	
5/18/2018	5	LDW18-C05-CL09	14:48	25					x
5/18/2018	5	LDW18-C05-CL18	14:50	25	yes			LDW18-C05-CLWB-Comp2	
5/18/2018	5	LDW18-C05-CL23	15:30	25		yes		LDW18-C05-CLSP-Comp1 and LDW18-C05-CLRM-Comp1	
5/18/2018	5	LDW18-C05-CL01	15:20	26	yes			LDW18-C05-CLWB-Comp2	
5/18/2018	5	LDW18-C05-CL16	15:00	26	yes			LDW18-C05-CLWB-Comp2	
5/18/2018	5	LDW18-C05-CL07	15:07	27	yes			LDW18-C05-CLWB-Comp2	
5/18/2018	5	LDW18-C05-CL04	14:43	29					x
5/18/2018	5	LDW18-C05-CL13	15:05	29	yes			LDW18-C05-CLWB-Comp2	
5/18/2018	5	LDW18-C05-CL17	15:20	32		yes		LDW18-C05-CLSP-Comp1 and LDW18-C05-CLRM-Comp1	
5/18/2018	5	LDW18-C05-CL10	15:32	33	yes			LDW18-C05-CLWB-Comp2	
5/18/2018	5	LDW18-C05-CL14	14:55	33					x
5/18/2018	5	LDW18-C05-CL02	14:41	40	yes			LDW18-C05-CLWB-Comp2	
5/15/2018	6	LDW18-C06-CL03	11:00	20					x
5/15/2018	6	LDW18-C06-CL01	10:45	22	yes			LDW18-C06-CLWB-Comp2	
5/15/2018	6	LDW18-C06-CL08	11:26	22		yes		LDW18-C06-CLSP-Comp1 and LDW18-C06-CLRM-Comp1	
5/15/2018	6	LDW18-C06-CL12	11:03	22					x
5/15/2018	6	LDW18-C06-CL11	10:58	23	yes			LDW18-C06-CLWB-Comp2	
5/15/2018	6	LDW18-C06-CL16	11:55	23	yes			LDW18-C06-CLWB-Comp2	
5/15/2018	6	LDW18-C06-CL07	11:18	24					x
5/15/2018	6	LDW18-C06-CL13	11:12	24	yes			LDW18-C06-CLWB-Comp2	
5/15/2018	6	LDW18-C06-CL21	11:48	24	yes			LDW18-C06-CLWB-Comp2	
5/15/2018	6	LDW18-C06-CL10	11:49	25					x
5/15/2018	6	LDW18-C06-CL14	11:15	25		yes		LDW18-C06-CLSP-Comp1 and LDW18-C06-CLRM-Comp1	
5/15/2018	6	LDW18-C06-CL15	11:25	25					x
5/15/2018	6	LDW18-C06-CL19	11:40	25	yes			LDW18-C06-CLWB-Comp2	
5/15/2018	6	LDW18-C06-CL02	10:48	27	yes			LDW18-C06-CLWB-Comp2	
5/15/2018	6	LDW18-C06-CL09	11:37	27	yes			LDW18-C06-CLWB-Comp2	
5/15/2018	6	LDW18-C06-CL06	11:05	33	yes			LDW18-C06-CLWB-Comp2	
5/15/2018	6	LDW18-C06-CL18	11:36	34		yes		LDW18-C06-CLSP-Comp1 and LDW18-C06-CLRM-Comp1	
5/15/2018	6	LDW18-C06-CL17	11:33	39	yes			LDW18-C06-CLWB-Comp2	
5/15/2018	7	LDW18-C07-CL04	11:28	16					x
5/15/2018	7	LDW18-C07-CL02	10:50	20		yes		LDW18-C07-CLSP-Comp1 and LDW18-C07-CLRM-Comp1	
5/15/2018	7	LDW18-C07-CL01	10:45	24		yes		LDW18-C07-CLSP-Comp1 and LDW18-C07-CLRM-Comp1	
5/15/2018	7	LDW18-C07-CL03	10:49	25		yes		LDW18-C07-CLSP-Comp1 and LDW18-C07-CLRM-Comp1	

Collection date	Clam Tissue Collection Area ID	Clam ID	Collection Time	Width (mm)	Included in Other Risk Driver Composite?	Included in Inorganic Arsenic Composite?	Included in cPAH Porewater Investigation Area Composite?	Composite ID(s), if applicable	Extra Clam (Not Included in Composite)
5/18/2018	8	LDW18-C08-CL04	13:20	22	yes			LDW18-C08-CLWB-Comp2	
5/18/2018	8	LDW18-C08-CL06	12:23	22					x
5/18/2018	8	LDW18-C08-CL14	12:50	22		yes		LDW18-C08-CLSP-Comp1 and LDW18-C08-CLRM-Comp1	
5/18/2018	8	LDW18-C08-CL07	12:22	23	yes			LDW18-C08-CLWB-Comp2	
5/18/2018	8	LDW18-C08-CL08	12:25	25					x
5/18/2018	8	LDW18-C08-CL12	12:54	25	yes			LDW18-C08-CLWB-Comp2	
5/18/2018	8	LDW18-C08-CL19	12:50	26					x
5/18/2018	8	LDW18-C08-CL20	12:52	26	yes			LDW18-C08-CLWB-Comp2	
5/18/2018	8	LDW18-C08-CL13	12:53	28	yes			LDW18-C08-CLWB-Comp2	
5/18/2018	8	LDW18-C08-CL16	12:48	28					x
5/18/2018	8	LDW18-C08-CL05	12:21	29	yes			LDW18-C08-CLWB-Comp2	
5/18/2018	8	LDW18-C08-CL09	12:29	29		yes		LDW18-C08-CLSP-Comp1 and LDW18-C08-CLRM-Comp1	
5/18/2018	8	LDW18-C08-CL15	12:52	29	yes			LDW18-C08-CLWB-Comp2	
5/18/2018	8	LDW18-C08-CL02	12:02	30					x
5/18/2018	8	LDW18-C08-CL03	13:01	31	yes			LDW18-C08-CLWB-Comp2	
5/18/2018	8	LDW18-C08-CL01	11:55	32	yes			LDW18-C08-CLWB-Comp2	
5/18/2018	8	LDW18-C08-CL17	12:50	33		yes		LDW18-C08-CLSP-Comp1 and LDW18-C08-CLRM-Comp1	
5/18/2018	8	LDW18-C08-CL10	12:30	34	yes			LDW18-C08-CLWB-Comp2	
5/17/2018	9	LDW18-C09-CL01	12:30	22		yes		LDW18-C09-CLSP-Comp1 and LDW18-C09-CLRM-Comp1	
5/17/2018	9	LDW18-C09-CL05	13:35	22		yes		LDW18-C09-CLSP-Comp1 and LDW18-C09-CLRM-Comp1	
5/17/2018	9	LDW18-C09-CL07	13:05	25					x
5/17/2018	9	LDW18-C09-CL06	12:00	33		yes		LDW18-C09-CLSP-Comp1 and LDW18-C09-CLRM-Comp1	
5/17/2018	10	LDW18-C10-CL02	13:31	19					x
5/17/2018	10	LDW18-C10-CL01	12:13	23	yes			LDW18-C10-CLWB-Comp2	
5/17/2018	10	LDW18-C10-CL05	12:28	23		yes		LDW18-C10-CLSP-Comp1 and LDW18-C10-CLRM-Comp1	
5/17/2018	10	LDW18-C10-CL09	13:07	23	yes			LDW18-C10-CLWB-Comp2	
5/17/2018	10	LDW18-C10-CL14	13:22	23	yes			LDW18-C10-CLWB-Comp2	
5/17/2018	10	LDW18-C10-CL03	14:20	27					x
5/17/2018	10	LDW18-C10-CL11	13:21	27	yes			LDW18-C10-CLWB-Comp2	
5/17/2018	10	LDW18-C10-CL10	13:46	30		yes		LDW18-C10-CLSP-Comp1 and LDW18-C10-CLRM-Comp1	
5/17/2018	10	LDW18-C10-CL12	13:35	31	yes			LDW18-C10-CLWB-Comp2	
5/17/2018	10	LDW18-C10-CL13	13:39	33	yes			LDW18-C10-CLWB-Comp2	
5/17/2018	10	LDW18-C10-CL19	13:43	34	yes			LDW18-C10-CLWB-Comp2	
5/17/2018	10	LDW18-C10-CL04	13:39	35					x
5/17/2018	10	LDW18-C10-CL06	13:52	35	yes			LDW18-C10-CLWB-Comp2	
5/17/2018	10	LDW18-C10-CL08	13:42	35		yes		LDW18-C10-CLSP-Comp1 and LDW18-C10-CLRM-Comp1	
5/17/2018	10	LDW18-C10-CL07	12:59	36	yes			LDW18-C10-CLWB-Comp2	
5/17/2018	10	LDW18-C10-CL18	12:57	37	yes			LDW18-C10-CLWB-Comp2	

Collection date	Clam Tissue Collection Area ID	Clam ID	Collection Time	Width (mm)	Included in Other Risk Driver Composite?	Included in Inorganic Arsenic Composite?	Included in cPAH Porewater Investigation Area Composite?	Composite ID(s), if applicable	Extra Clam (Not Included in Composite)
5/18/2018	11	LDW18-C11-CL22	13:53	22					x
5/18/2018	11	LDW18-C11-CL23	13:40	22	yes			LDW18-C11-CLWB-Comp2	
5/18/2018	11	LDW18-C11-CL14	13:23	23	yes			LDW18-C11-CLWB-Comp2	
5/18/2018	11	LDW18-C11-CL16	13:40	24		yes		LDW18-C11-CLSP-Comp1 and LDW18-C11-CLRM-Comp1	
5/18/2018	11	LDW18-C11-CL06	12:57	25					x
5/18/2018	11	LDW18-C11-CL21	13:37	25	yes			LDW18-C11-CLWB-Comp2	
5/18/2018	11	LDW18-C11-CL01	13:10	26	yes			LDW18-C11-CLWB-Comp2	
5/18/2018	11	LDW18-C11-CL18	13:35	27	yes			LDW18-C11-CLWB-Comp2	
5/18/2018	11	LDW18-C11-CL13	13:02	30					x
5/18/2018	11	LDW18-C11-CL02	12:33	32	yes			LDW18-C11-CLWB-Comp2	
5/18/2018	11	LDW18-C11-CL03	13:22	32	yes			LDW18-C11-CLWB-Comp2	
5/18/2018	11	LDW18-C11-CL04	13:27	32		yes		LDW18-C11-CLSP-Comp1 and LDW18-C11-CLRM-Comp1	
5/18/2018	11	LDW18-C11-CL19	12:47	32					x
5/18/2018	11	LDW18-C11-CL24	13:53	34	yes			LDW18-C11-CLWB-Comp2	
5/18/2018	11	LDW18-C11-CL05	12:52	35	yes			LDW18-C11-CLWB-Comp2	
5/18/2018	11	LDW18-C11-CL07	13:05	35		yes		LDW18-C11-CLSP-Comp1 and LDW18-C11-CLRM-Comp1	
5/18/2018	11	LDW18-C11-CL20	13:32	35					x
5/18/2018	11	LDW18-C11-CL17	13:28	36	yes			LDW18-C11-CLWB-Comp2	

Tissue Preparation Notes



Analytical Resources, Incorporated
Analytical Chemists and Consultants

Organic Extractions Prep Sheet Notes

Extraction Parameter: Tissue Prep

Element Batch: BGF0686

WorkOrder(s): 18F0364

Matrix: Tissue

1. Shuck, rinse, and weigh each individual clam.
2. Composite and homogenize each group of ten clams into Area composites (C01, C02, etc.) accordingly.
3. Take 25 g from each Area ID and composite into segment composite (composite of composites).
Take 25g from C01, C02, and C03 composited to make 75g of S1.
Take 25g from C04, C05, and C06 composited to make 75g of S2.
Take 25g from C08, C10, and C11 composited to make 75g of S3.
4. Take 40g from each of the nine Area composites (C01, C02, etc.) and put in new jar and return to sample receiving.
5. Take 10g from each segment composite (S1, S2, and S3) and put in new jar and return to sample receiving.

Record weights on next page.

Prep Start Time: 9:30
Analyst/Date: YL/CT 06/28/18
Special Instructions:

Prep End Time: 17:15
Balance ID: B334705934

6/22/18
M
H

Record weights of individual clams and area composites.

Sample 18F0364-01	Weights
Area: C01	
LDW18-C01-CL03	19.96 g
LDW18-C01-CL07	18.55 g
LDW18-C01-CL06	22.82
LDW18-C01-CL15	22.95
LDW18-C01-CL24	28.33
LDW18-C01-CL17	33.75
LDW18-C01-CL19	45.66
LDW18-C01-CL20	56.67
LDW18-C01-CL16	61.26
LDW18-C01-CL21	61.15

Sample 18F0364-02	Weights
Area: C02	
LDW18-C02-CL14	17.45 g
LDW18-C02-CL06	21.42 g
LDW18-C02-CL16	12.17
LDW18-C02-CL01	35.45
LDW18-C02-CL10	35.57
LDW18-C02-CL17	48.63
LDW18-C02-CL20	28.71
LDW18-C02-CL05	44.22
LDW18-C02-CL15	28.68
LDW18-C02-CL08	54.11

Sample 18F0364-03	Weights
Area: C03	
LDW18-C03-CL04	11.67
LDW18-C03-CL06	19.67
LDW18-C03-CL12	11.27
LDW18-C03-CL14	8.96
LDW18-C03-CL24	17.99
LDW18-C03-CL17	15.55
LDW18-C03-CL08	26.72
LDW18-C03-CL11	22.27
LDW18-C03-CL20	22.93
LDW18-C03-CL15	24.86

Sample 18F0364-04	Weights
Area: C04	
LDW18-C04-CL10	9.56 g
LDW18-C04-CL20	6.83 g
LDW18-C04-CL01	13.45
LDW18-C04-CL04	11.44
LDW18-C04-CL07	15.42
LDW18-C04-CL16	15.75
LDW18-C04-CL18	19.49
LDW18-C04-CL02	21.94
LDW18-C04-CL11	18.54
LDW18-C04-CL21	27.16

Sample 18F0364-05	Weights
Area: C05	
LDW18-C05-CL24	9.41
LDW18-C05-CL06	12.38
LDW18-C05-CL05	13.76
LDW18-C05-CL18	22.44
LDW18-C05-CL01	15.81
LDW18-C05-CL16	19.88
LDW18-C05-CL07	20.92
LDW18-C05-CL13	44.14
LDW18-C05-CL10	36.32
LDW18-C05-CL02	57.74

Sample 18F0364-06	Weights
Area: C06	
LDW18-C06-CL01	14.74
LDW18-C06-CL11	12.17
LDW18-C06-CL16	14.32
LDW18-C06-CL13	14.36
LDW18-C06-CL21	15.83
LDW18-C06-CL19	11.61
LDW18-C06-CL02	26.69
LDW18-C06-CL09	31.17
LDW18-C06-CL06	42.27
LDW18-C06-CL17	48.68

Record weights of individual clams and area composites.

Sample 18F0364-07	Weights
Area: C08	
LDW18-C08-CL04	12.79
LDW18-C08-CL07	13.49
LDW18-C08-CL12	17.31
LDW18-C08-CL20	15.56
LDW18-C08-CL13	25.44
LDW18-C08-CL05	21.28
LDW18-C08-CL15	44.77
LDW18-C08-CL03	39.45
LDW18-C08-CL01	34.79
LDW18-C08-CL10	40.69

255.67

Sample 18F0364-08	Weights
Area: C10	
LDW18-C10-CL01	11.83
LDW18-C10-CL09	9.66
LDW18-C10-CL14	9.45
LDW18-C10-CL11	39.42
LDW18-C10-CL12	19.25
LDW18-C10-CL13	33.43
LDW18-C10-CL19	48.38
LDW18-C10-CL06	14.19
LDW18-C10-CL07	36.68
LDW18-C10-CL18	46.45

254.52

Sample 18F0364-09	Weights
Area: C11	
LDW18-C11-CL23	7.44
LDW18-C11-CL14	19.72
LDW18-C11-CL21	24.45
LDW18-C11-CL01	15.12
LDW18-C11-CL18	17.65
LDW18-C11-CL02	31.37
LDW18-C11-CL03	26.34
LDW18-C11-CL24	19.95
LDW18-C11-CL05	48.21
LDW18-C11-CL17	48.22

247.43